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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Munehiro et al.

Serial No. 09/434,498

Filed: November 5, 1999

For: REVERSIBLE HEAT-SENSITIVE  
PAPER AND METHODS FOR  
WRITING INFORMATION

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) Atty. Docket No.: ASAIN0058

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Group Art Unit: 1774 #17

Examiner: B. HESS

Date:

EW  
9-27-02

DECLARATION UNDER 37 C.F.R. § 1.132

Assistant Commissioner for Patents  
Washington, D. C. 20231

Sir:

1. I, Yasuro Yokota, state that I am an expert in the field of non-impact printing technology research and development. A copy of my curriculum vitae (Exhibit A) is attached herewith.

2. I have authored or co-authored and published the following paper.

1. Y. Yokota, M. Ikeda, and S. Hiraishi, "Rewritable Thermal Recording Material,"  
Proceedings of the 9<sup>th</sup> International Congress on Advances in Non-Impact Printing Technologies,  
pp. 413-416, 1993.

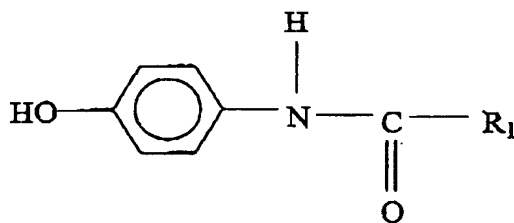
3. I am familiar with the above captioned application and understand that at issue is the following factual issue: whether the patent application, as originally filed, would enable one of ordinary skill in the art to make and use the claimed invention. Specifically, the issue of fact is

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whether one of ordinary skill in the art would know how to prepare a "reversible heat-sensitive paper" that includes a reversible heat-sensitive layer that has an electron donative dyestuff precursor and a reversible developer that colors and uncolors the electron donative precursor, by heating the reversible heat sensitive layer to a molten state and then quickly cooling to a solid colored state" as recited in claim 3, for instance.

4. To one skilled in the art, a "reversible heat-sensitive paper" would reasonably be understood to be composed of a supporting base, such as a paper sheet, provided with a heat-sensitive recording layer so that when heated an image is formed on the heat-sensitive layer as described in the application's specification (page 1, lines 10-18). To make a color forming/decoloring type of heat-sensitive paper that is "reversible" or "rewritable," thermochromic materials including a leuco dye and acidic compounds are used. The leuco dye is an electron donating dye precursor and certain acidic compounds well known in the art are used as the reversible developer. The specification refers to "[t]ypical reversible developers include, for example, a phenol-based compound with long chains in an alkyl group" (specification, page 2, lines 18-20).

One skilled in the art would instantly recognize that the "typical reversible developer" referred to, being a phenol-based compound with long chains in an alkyl group, would be



$R_1$  : Long alkyl chain

as described in my article titled "Rewritable Thermal Recording Material" (Proceedings of the 9<sup>th</sup> International Congress on Advances in Non-Impact Printing Technologies, pp. 413-416, 1993), (Exhibit B) hereafter referred to as the "Yokota article." This acidic phenolic compound provides color forming when heated with a thermal head, whereas heating with a hot iron stamp (100°C) causes decoloring. This color forming/decoloring property of the phenolic compound is not observed at all in other acidic developing agents such as Bisphenol-A or Benzyl p-hydroxybenzoate. In fact, it was experimentally determined that the color forming/decoloring property of my acidic phenolic compound is dependent upon the cooling rate after heating. As shown in Fig. 3 of the Yokota article, the optical density of the molten mixture of the leuco dye and the phenolic compound depends upon the cooling rate after heating in a linear fashion.

X-ray diffraction data (see Fig. 5) suggests that when the molten mixture of the leuco dye and the phenolic compound cool slowly a decolorized crystalline state forms (e.g., when heating with a hot iron stamp), whereas when the molten mixture cools quickly a colored noncrystalline state occurs (e.g., when heating with a thermal head).

Consequently, the specification of the instant application directly refers to the typical phenol-based compounds with long chains in the alkyl group, which are known to those of ordinary skill in the art as a reversible developer used with electron donating leuco dyestuff

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precursors. Furthermore, those of ordinary skill in the art would know that these phenol-based compounds with long chains in the alkyl group, being reversible developers, have the color forming/decoloring property that depends upon the rate of cooling as recited in claim 3, for example.

5. I declare under penalty of perjury that the foregoing is true and correct, that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed by,

Date: September 13, 2002

Yasuro Yokota  
Yasuro Yokota

## Education

Graduate School of Engineering of Hiroshima University (Higashihiroshima-city, Hiroshima)  
Master of Engineering in Chemistry, 1990

## Work Experience

MITSUBISHI PAPER MILLS LIMITED      Apr. 1990 to Present  
PRODUCT DEVELOPMENT LAB.  
CORPORATE RESEARCH CENTER (Katsushika-ku, Tokyo)      Jan. 1999 to Present

- Develop ink-jet printing papers.

TECHNOLOGY RESEARCH LAB.  
CORPORATE RESEARCH CENTER (Tsukuba-city, Ibaraki)      Apr. 1990 to Dec. 1998

- Developed thermal recording mediums.

Signed by ,

Date: September 13, 2002

Yasuro Yokota  
Yasuro Yokota